Improving Training Capability

The Reaper and Predator (pictured) are providing support for US Army units operating in Iraq and Afghanistan. *Image credit: Rob Jensen/USAF.*

Training for air support to operations in the urban environment is particularly challenging because of the complexity of that environment. **Chuck Weirauch** reports on current developments to close training gaps.
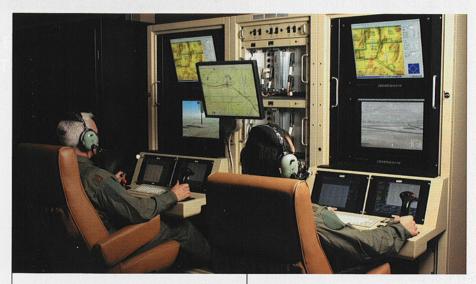
Unmanned aircraft systems, rotary wing aircraft, and fixed wing aircraft all have one thing in common – they all can, and do, provide air support to soldiers operating in urban environments – and operators and flight crews all need training in operating in such a complex environment. The US Services agree there is a need for an improved training capability.

UAS

Air support for ground forces in villages and cities is often provided by unmanned aircraft systems (UAS) operating units employing Predator, Reaper and Shadow UAVs.

The US Air Force's Air Combat Command (ACC) operates and provides training for the MQ-1 Predator and MQ-9 Reaper UAS, both of which are being employed to a considerable extent providing support for US Army units operating in Iraq and Afghanistan. L-3 Link Simulation & Training provides Predator Mission Aircrew Training System (PMATS) units to the ACC at various locations. Still, gaps remain in providing the most realistic urban environment in which crews can train.

"What the Air Force is looking for now is a lot more fidelity in the urban environment, along with the simulation of the sensors," said Frank Delisle, L-3 Link Simulation & Training Vice President of Engineering. "So the challenge from the technology standpoint, with perhaps thousands of entities with different behaviors in an urban environment, is to create a realistic and relevant environment for their missions. What we are

The USAF's Predator Mission Aircrew Training System (PMATS).
Image credit: L-3 Link Simulation & Training.

seeing for UAS training is a push for us to create that urban-rich environment in the infrared sensor spectrum. It's not an out-the-window issue."

Currently the Air Force is in the process of building requirements for the next generation of PMATS upgrades. Meanwhile, the company is working with its PMATS customers to increase its training capability in the urban environment. A primary tool under consideration for this upgrade is the company's HD World, which it describes as a military synthetic environment designed to replicate the urban environment.

This system features large-area environment databases and real-time graphics rendering, along with physics-based inter-

actions and artificial intelligence to provide realistic entity behavior modeling.

While Air Force UAS training would certainly benefit from such high-fidelity simulations, the ACC is also looking for other ways to increase the quality of its training. One way is through the participation of additional commands and organizations in its live training exercises, said Major Matt Martin, ACC MQ-1 and MQ-9 Functional Manager and Chief of the Predator/ Reaper Operations Branch at Langley Air Force Base. Another goal is the expansion of the ACC's UAS training capacity so that continuation training can be provided. Martin points out that with the present training resources, the current high operations tempo for UAS operations does not allow crews time for such recurrent training. However, he expects that such training can take place when a second UAS training team is established in the near future.

"The vast majority of our missions these days are in direct support of Army units, and a high percentage of these are in dense urban environments like Baghdad or Sadr City," Martin said. "The key to the success of these operations is the degree of integration with those Army maneuvering units. Therefore, the key to preparing crews to provide that high level of support is to teach them how to integrate. The challenge therefore is, how do you simulate providing direct support in a dense urban environment when it is hard to tell friend from foe."

Once UAS operators complete basic simulation-based and over-the-shoulder simulator training with experienced UAS crews as mentors, they fly live exercises on the Nellis Air Force Range in Nevada to carry out numerous scripted mission scenarios. While the crews can only fire weapons in the simulator, the live range training experience allows them to work with joint terminal attack controllers (JTAC)s who direct close air support operations, Martin explained. These live-fly exercises are vital to the integration with the ground forces piece of training, since the JTACS are the key elements in air-ground attack coordination, he added.

"The ability to simulate JTACs in the simulator has not been worked out yet," Martin said. "Today we need high-quality training out on the range with JTACs and other aircraft to simulate that integration."

According to its manufacturer, the AAI Corporation, the Shadow UAS has now been flown more than 300,000 operating hours in Iraq and Afghanistan, playing a key role in close air support for urban operations conducted by the active Army, Army National Guard and Marines. However, the number of training devices for that aircraft has been limited, creating a training gap.

Closing that training gap, the Army's Program Executive Office for Simulation, Training and Instrumentation (PEO STRI) this August awarded a $12 million contract, with a potential total scope of $30 million, to AAI for a Shadow Crew Trainer (SCT) in support of the Army National Guard. AAI will deliver up to 41 Shadow Crew Trainer systems, 18 Part Task Trainers, training courseware and interactive multimedia instruction. The first trainers are to be delivered 90 days after the contract award.

According to Mike Younce, PEO STRI Product Line Manager for Air and Command Tactical Trainers (ACTT), the new Shadow Crew Trainer system will ultimately be able to train a full platoon set of Shadow operators. In addition to instructor/operator and crew ground control stations, the primary trainer will also have a computer-based training (CBT) station for the launch operator. In addition, the contract calls for an air vehicle part task trainer, launcher part task trainer and a separate trainer for command, launch and recovery operations.

"So we will be able to train everybody, all the way from the guys who launch it, those who fly it, the commanders who give them their tasks and those who recover and maintain the aircraft as well," Younce explained.

According to Gary Stevens, ACTT Program Manager, the Army National Guard approached PEO STRI with a training gap - the existing Shadow trainer does not train all the critical tasks required - and needed the training agency's procurement assistance. Contributing to that problem were equipment shortages and live range availability challenges. If the new Shadow training system proves successful for the Guard, the active Army may be interested in obtaining the new Shadow trainers as well, he said.

"The big piece here is that the Shadow Crew Trainer employs the same operational flight program software used in the aircraft itself," Stevens pointed out. "So we will have a high correlation

AVCATT – Aviation Combined Arms Tactical Trainer in use with the US Army.
Image credit: US Army.

between the simulator and the actual system. This allows us to rapidly field updates as accurately as we can. The other major piece is that the trainer is interoperable with AVCATT, so now we can train our aviators and our Shadow platoons in a collective environment. Both are vital in training for urban environment operations, where we need to quickly train for new tactics, techniques and procedures."

Rotary Wing Training

Higher fidelity simulation, along with the Army's next-generation common synthetic environment and scheduled hardware and software upgrades for its Aviation Combined Arms Tactical Trainer (AVCATT), will be a part of the Army's answer to the challenge of improving urban operations training for its rotary wing aircraft. A new image generator will provide higher-resolution visual imagery. It is capable of supporting the service's advanced Synthetic Environment Core (SE Core) and a new helmet-mounted display (HMD) that have been approved for installation in AVCATT units at Fort Rucker, Ala. Lt. Col. Gary Stevens is Program Manager for the PEO STRI ACTT. Stevens anticipates that the new image generator and HMD retrofitting suites will be fielded by next spring, along with SE Core databases.

"These upgrades will provide higher fidelity simulation throughout the AVCATT system," he said. "In the current image generator, we are limited to less than a hundred visible entities in a scene because of its computing processing power. The new image generator has more power and adds more fidelity, since it can handle more than double that amount of entities."

The addition of SE Core, the Army's new digital common synthetic environmental database that it plans to eventually incorporate into all of its major training systems, will add more fidelity to the urban environment, Stevens added. For example, it will be able to model the large numbers of armed, including man-portable air defense (MANPAD) weapons, and unarmed entities likely to be found in urban environments that can be engaged during training scenarios. Providing a richer training environment will enhance rotary wing aircrew training for urban operations by simulating more mission detail, Stevens explained.

According to Link Simulation & Training's Don Rodriquez, director of strategic initiatives, a lot of the company's focus right now is in modifications for AVCATT, primarily in providing concurrency of the systems. The company is also supporting the Army's "swapping out" of the current AVCATT synthetic environment and the integration of SE Core into AVCATT trainers.
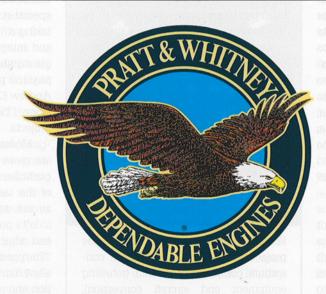
Fixed Wing

New out-the-window graphics display advances in fixed-wing flight simulators in the near future are going to dramatically improve training for the urban environment for those aircraft, Rodriquez predicted. Liquid crystal on silicon (LCoS) display technology upgrades are a key to this improvement, he said.

"The requirements we are seeing from our customers in the fixed-wing arena is rising to 20/20 visual acuity in the out-the-window scene," Rodriquez pointed out. "This requirement is aimed at detection, orientation, recognition and identification of targets. We are currently operating at 20/40. We expect an upgrade for the digital projections technology within the next six months to a year that will take that to 20/20. So what you will be seeing now is technology enabling the Holy Grail of the fighter pilot, to have simulators with that kind of out-the-window capability."

The expansion of military operations in urban terrain (MOUT) sites at live ranges is another element that has and will to continue to improve live training for fixed wing aircraft as a complement to simulation training, said Major Christopher Davis, ACC F-16 Functional Area Manager and Chief of Distributed Mission Operations (DMO) at Langley AFB. The MOUT installations are an important part of training for urban operations during Green Flag training exercises, Davis explained. Also key to urban operations training is the ability to simulate JTACs in the DMO network, he said.

"What has been the major improvement in our simulators is the ability of the sensor systems to be simulated to show you that close-up view (of details in an urban environment) from wherever you are," Davis said. "However, there is a significant amount of work left to be done in simulating the sensors correctly. What we really need is an IR representation of that door or that vehicle. Sensor visibility in flight simulators deserves additional scrutiny." ms&t